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VI. *On the Nature of Sleep.* By A. P. W. PHILIP, M.D. F.R.S. L. & E., &c.

Read March 7, 1833.

OF all sciences Physiology is most exposed to causes of inaccuracy. The subjects of experiment are here the most complicated, and the phenomena at once the most varied, and bearing the least resemblance to those we are accustomed to contemplate. Hence it is that the groundless theories of our predecessors have been succeeded by the erroneous inferences of modern times, and the student is bewildered by contradictory evidence, until the conclusion is often forced on him, that, with the exception of some of the great outlines which have been established by such evidence as cannot be questioned, the subject is from its nature too perplexed to admit of a clear and satisfactory exposition. It will readily be admitted by those who are accustomed to contemplate the works of nature, that such a result is less the fault of the subject than the mode of investigating it; for although physiology is not a demonstrative science, it is as open to observation and experiment as any other; but greater caution in our inferences is required, in proportion as the sources of error are more numerous and less easily detected.

If the attempt to free some parts of this science from the confusion in which it has been involved, should expose me to the charge of presumption, because it can only be done by judging the labours of others, I have at least the apology of the necessity of the task, and of not a short life, in a great degree devoted to the subject; for although it is not more than twenty years since I commenced the investigation, the progress of which the Society did me the honour to report, my experiments on subjects immediately connected with that inquiry were commenced within a couple of years after I had begun the study of medicine, and have with intervals been continued ever since.

The two last papers which I had the honour to present to the Society, on the circulation of the blood, and on a subject immediately connected with it, the relation which subsists between the nervous and muscular systems, were written with the view here stated. The present paper is written with the same

view, and forms indeed only a continuation of the subjects of these papers. It is evident from the most cursory view of the phenomena of sleep, that these subjects must be imperfect without an inquiry into the nature of a state which so materially influences the relation of the nervous and muscular systems.

There is no question relating to the living animal which involves a more general view of its phenomena than the nature of sleep, and, probably for this reason, none respecting which opinions are more vague and unsatisfactory. I propose to review these various phenomena for the purpose of ascertaining the organs in which its immediate cause exists, the laws on which it depends, and the effects it has on those parts of the system which are not concerned in its production.

We can perceive no final cause of the alternation of watchfulness and sleep, but such as has its origin in the imperfection of our nature. The end of life is enjoyment, and as sleep, if we may not regard it as a positive evil, prevents uniformity in the accomplishment of this end, to say nothing of the occasional inconveniences which attend it, were we as well acquainted with the principles of the animal, as we are with those of the solar system, we should probably find that this defect is, in the nature of things, as unavoidable, as the recurrence of darkness and a degree of cold which benumbs, and of heat which overpowers our faculties.

We shall never perhaps be able to tell why certain organs are capable of constantly maintaining their functions, while others require intervals of repose ; but it is not difficult to perceive the necessity of the former part of the arrangement, because the permanent functions are those on which the life of the animal immediately depends, the intervals of repose belonging to those alone which are the means of intercourse with the world that surrounds him, and which therefore have no direct tendency to destroy life.

In tracing the relation of the nervous and muscular systems in the last paper I presented to the Society, I had occasion to recall to their recollection the different relations which the muscles of voluntary and involuntary motion bear to the nervous system, and to point out that the two sets of nerves, which form the medium of connexion between the active parts of that system, and these classes of muscles, obey different laws ; the one conveying the influence of only certain parts of the brain and spinal marrow, the other conveying and

combining that of the whole of these organs *. The former, it is now to be observed, while they are associated, on the one hand, with the organs of sense and the muscles of voluntary motion, are associated, on the other, with those parts of the brain and spinal marrow on which the mental functions depend †; the latter, namely, the nerves which arise, as far as we can ascertain by experiment, from all parts of those organs, being associated, on the one hand, with all those parts, and on the other, with the muscles of involuntary motion and the organs on which life immediately depends.

Thus we find in the more perfect animals two systems in a great degree distinct from each other; the former may be termed the sensitive system, that by which they perceive and act, and consequently are connected with the external world; the latter the vital system, that by which their existence is maintained. To understand the nature of sleep, we must determine the properties peculiar to each of those systems which have relation to that state, and the manner in which each is capable of influencing the other.

When the reasoning powers are fatigued by continued attention, the feelings by the excitement of the passions, the eye by the exercise of sight, the ear by that of hearing, the muscles of voluntary motion by powerful and repeated contractions, &c. the organs of all these functions cease to be excited. In order again to excite them, either stronger stimulants must be employed, or they must be refreshed by repose, during which, the functions of life still continuing, their due degree of excitability is restored; and they thus again become sensible to the usual stimulants of life.

The operation of this law in the sensitive system may be observed under all degrees of excitement. We can perceive a very sensible effect from slighter degrees of exhaustion than that which produces sleep. After sleep there is a vigour which gradually declines till we sleep again; so that every degree of excitement is followed by its corresponding degree of exhaustion. This law of our frame is so prevalent that physiologists have generally regarded it as belonging to every part of the system; but any degree of excitement which produces weariness, must, by a certain continuance of it, produce inability. It is

* The 57th and following pages of this volume of the Transactions.

† It has been shown experimentally in my Inquiry into the Laws of the Vital Functions, that the spinal marrow partakes of the sensorial functions. This is very little the case in man, but to a great degree in some animals.

evident, therefore, that were the organs of life to obey this law, a total failure of their functions must soon ensue. The sensitive system is restored because the powers of life remain ; but if these powers suffer a similar exhaustion, by what means can their restoration be effected ? This consideration alone might have convinced physiologists that their excitement is regulated by other laws.

It is evident indeed that the circulation continues uninterruptedly ; but this has been explained by supposing that the heart and vessels during the intervals of their contractions recover their excitability, the exhaustion of which, during each contraction, has been regarded as the cause of the relaxation which succeeds it.

This theory appeared to apply well to the heart because during the intervals of its contractions the stimulus which excites it is removed ; but how does it apply to the vessels from which the stimulus is never removed, and which can support the motion of the blood, as has been ascertained by many experiments, independently of the heart * ? An organ exhausted by the action of any stimulant will never recover its excitability under the operation of the same agent which has exhausted it. The retina will never recover under the same degree of light which has impaired its power, nor the nerve of the ear under the same degree of sound.

A very simple experiment, however, demonstrates that the theory is as erroneous with respect to the heart as the vessels. If in a newly dead animal a ligature be thrown around the arteries attached to the heart so that it continues gorged with blood, its contractions, although ineffectual, still continue to recur with the same regularity as before the ligature was applied. When salt is sprinkled on the muscles of the newly dead animal, the effect is not permanent contraction succeeded by permanent relaxation, but a constant succession of contractions and relaxations, notwithstanding the continued application of the same stimulant, till their power is exhausted.

An experiment suggested by Dr. WOLLASTON, and with which he used to amuse his friends, strikingly illustrates the interrupted nature of muscular contraction, even where it is as nearly permanent as the nature of the muscle in its healthy state admits of †. If the elbows be made to rest on a table, and the end of a finger of each hand be pressed steadily on that part of the ear

* Experimental Inquiry, Part II.

† We have reason to believe that in spasm the muscle is in a state of permanent contraction, probably the cause of the pain which attends this state.

which covers the external passage so as to press it down forcibly on the end of that passage, we hear a rapid succession of distinct concussions. This he ascribed to our thus being made sensible of the motion of the blood in the vessels. But did it proceed from this cause, the repetition of the concussions would correspond with the beats of the heart. That it arises from the rapid succession of the contractions of the muscles of the arm by the action of which the end of the finger is pressed against the ear, may be proved by making the experiment in the following manner. Let the arms rest on the table in such a way as to press by their weight on the fingers which stop the ears, care being taken that the stopping of the ears be left to the weight of the arms, and in no degree produced by the action of the muscles. When we succeed in this attempt, all sense of concussion immediately ceases. It will be found that just in proportion as we succeed in preventing the action of the muscles, the noise abates, and when we perfectly succeed, ceases altogether. The same property of the muscle may be made perceptible to another of our senses. If a bird be allowed to rest on the finger, we perceive by the finger its weight alone. It so balances itself that the continued action of its muscles becomes unnecessary. But if the finger be moved, so that the bird is obliged to cling to it to maintain its place, we perceive a thrill which consists of the same rapid succession of concussions as in the former instance is perceived by the sense of hearing. The larger the bird is, they are of course the more distinct.

It is quite evident from all that has been said, that the state of the muscle is wholly different in the relaxation which intervenes between the contractions, from that which has supervened when the same stimulus can no longer excite it. Now it is not the first but the last of these states which indicates any loss of power in the muscle.

The whole phenomena of the animal body demonstrate that although it is true that a muscle may be exhausted by powerful and repeated contractions, it is not subject to the law which prevails in the sensitive system, that all degrees of excitement are followed by proportional exhaustion.

Thus it is that the muscles of voluntary motion often suffer exhaustion, because, being under dominion of the will, they are frequently exposed to excitement which is excessive either in its degree or duration, or both. Their exhaustion does not interfere with health, and for their restoration means are

provided in the usual functions of the system. But the muscles employed in the vital functions obey a better regulated stimulant, which never, except in disease, produces any degree of excitement that impairs their power. In many diseases, we see the effect of such excitement. If it does not abate soon, and we cannot by artificial means in a short time reduce it, death is always the consequence: and even a short continuance of it produces a degree of debility that so impairs the powers of life as to render their restoration both slow and difficult. Thus it is evident that on the capability of the muscular fibre to be moderately excited, without suffering any degree of exhaustion, life immediately depends.

This property belongs equally to the muscles of voluntary as those of involuntary motion, the exemption of the latter from exhaustion in the healthy state of the system, not arising from any peculiarity in the nature of these muscles, but from the circumstances in which they are placed. In many diseases we find the muscles of voluntary motion in a state of excitement, that is, in a state of constant contraction and relaxation, which constitutes their state of excitement, during all our waking hours, that is, during all the time that those parts of the nervous system with which they are associated are capable of exciting them, without a sense of weariness or any other sign of exhaustion in them. The muscles of respiration which are, in the strictest sense, muscles of voluntary motion* are in a state of constantly renewed and gentle excitement during life. It is only in asthma and other cases, where their excessive action is required, that they experience any degree of exhaustion.

Thus the muscular fibre in its laws of excitement differs essentially from the other organs with which it is associated in the sensitive system. It is neither like them in the healthy state capable of uniform excitement, nor in it are all degrees of excitement followed by proportional exhaustion. But in the vital system, although all its other parts are capable of uniform excitement, the muscular fibre is not the only organ in which certain degrees of excitement are unattended by exhaustion. The same is true both of the ganglionic nerves and those organs of the brain and spinal marrow from which they derive their power, and which, it appears from direct experiment, are distributed throughout the whole extent of the brain and spinal marrow.

* Philosophical Transactions for 1829, and Experimental Inquiry.

The secreting organs indeed, as well as those of circulation, are less vigorous in sleep than in our waking hours ; but this, we shall find, besides that a diminished excitement cannot restore impaired excitability, but must, in proportion to its degree, still add to the exhaustion, is the necessary consequence of causes very different from their partaking of the exhaustion which prevails in the sensitive system. It is in disease alone that they suffer any degree of exhaustion, which in them produces a different species of debility, not an exhaustion analogous to that of the sensitive system ; which it is even a means of preventing by impeding the functions of life, and thus indirectly proving a cause of irritation to this system.

It appears from all that has been said, that in the sensitive system alone we find organs capable of exhaustion from all degrees of excitement, and the exhaustion of which is consistent with a state of health, namely, the nerves of this system and those parts of the brain and spinal marrow with which they are associated ; but it is a necessary inference from the facts stated in the last paper I had the honour to lay before the Society, that the former of these only obey the latter. To the latter alone therefore we must look for the exhaustion which is the immediate cause of sleep.

The parts of the brain and spinal marrow which are associated with the nerves and muscles of the sensitive system, gradually, from the effect of the usual stimulants of life, suffer such a degree of exhaustion that those stimulants can no longer excite them ; and their functions, unless stronger stimulants be applied, necessarily cease. Impressions from external objects consequently are no longer perceived, and therefore cannot produce their usual effects either on mind or body. Thus the expenditure of excitability in those parts of the brain and spinal marrow, and consequently in the nerves and muscles whose functions depend on them, being arrested, the vital functions still continuing, such an accumulation of it takes place in all these organs as again renders them sensible to the usual stimulants of life, and the activity of the sensitive system is restored.

On the parts of the brain, and, in some animals, of the spinal marrow, as I have already had occasion to observe, which are associated with the nerves and muscles of the sensitive system, the mental functions depend. Hence the phenomena of dreaming, on which I shall make a few observations, imme-

diately connected with the other parts of this paper, after considering the manner in which the vital, is influenced by the state of the sensitive, system in sleep.

We are now to consider the effects of sleep on those organs which have no share in its production.

One of the most important circumstances relating to the state of the sensitive system in sleep is that it is never so complete as, under all circumstances, to prevent its excitement. On this alone it depends, we shall find, that it has no fatal tendency. The degree of sensibility which remains in sleep is the distinguishing mark between it and the torpor of disease. That sleep alone is healthy from which we are easily roused. If our fatigue has been such as to render it more profound, it partakes of disease, that is, as will appear more clearly from what I shall have occasion to say of the different species of apoplexy, the vital system partakes of the debility, or some cause is operating which prevents the restoration of the sensitive system.

Distinct as the vital and sensitive systems are, we know that neither can long survive the other. In a paper which appeared in the Philosophical Transactions for 1829, I stated or referred to the facts which prove that in all modes of death, except the most sudden, arising from causes which so impress the nervous system as instantly to destroy all the functions, those of the sensitive system are the first which cease. The animal only dies when his means of enjoyment and intercourse with the world which surrounds him, no longer exist. This consequence is constant and never long delayed. It is necessary therefore to a clear view of the state of the functions of the animal body in sleep, to determine the bonds of union between the sensitive and vital systems, at first view so distinct, which render their existence, except for a very limited time, inseparable.

That the sensitive cannot exist independently of the vital system, is evident, on the slightest consideration; but the dependence of the latter on the former is much less so. The facts stated in the paper just referred to, prove that in the more perfect animals, the function of respiration, being the only vital function which requires the cooperation of the sensitive system, is here the bond of union. It appears from those facts that the muscles of respiration are, in the strictest sense, muscles of voluntary motion, the excitement of

which consequently depends on the powers of that system. When the power of sensation wholly ceases, we cease to breathe.

So confused have been the ideas of physiologists on this part of the subject, that to account for the continued action of the muscles of respiration and their intimate connexion with the vital system, they have supposed a third class of muscles partaking of the nature of both the others, those of voluntary and involuntary motion, to which it has been alleged the muscles of respiration belong. If this be the case, these muscles must change their nature every instant, because they are the same muscles which are employed in a thousand other acts universally acknowledged to be mere acts of volition; and, on the other hand, when powerful causes impede the breathing, all the muscles of the trunk are employed in this function. Besides, the facts which have been laid before the Society prove not only that there is no such class of muscles as that here supposed, but that the laws of excitability are the same in all muscles, the difference between the muscles of voluntary and involuntary motion depending wholly on the nature of their functions and the circumstances in which they are placed. The nervous influence, although equally capable of influencing both, is supplied to them in different ways and for different purposes, the usual functions of the muscles of voluntary wholly, of involuntary motion in no degree, depending on that system. The action of the muscles of respiration continues during sleep, because the exhaustion of the sensitive system is not complete, and the cause which influences this system in their excitement, continues in our sleeping as well as waking hours; and the same is true of all other muscles of voluntary motion, as far as the causes which induce us to excite them are applied. In the soundest sleep we move our limbs if their posture be rendered uneasy. Are we not obliged to guard against these causes in sleep, else the motions they would produce would quickly rouse us. Those of respiration are too gentle to produce this effect.

The only change which takes place in the action of the muscles of respiration during sleep is, that in proportion as the sensibility is impaired they are excited less readily, and the act of respiration is thus rendered less frequent, a more powerful application of the cause being required; the consequence of which is, that when they are excited, the air is drawn in with greater force; hence, and from the relaxation which is apt to take place during sleep in the

parts about the fauces, the cause of snoring*. Thus we generally observe that the snoring is the louder the slower the breathing, that is, the relaxation of the fauces being the same, the more profound the sleep. The loudest snoring I ever heard, so loud as to startle the attendants, was in the last ten minutes of the life of a person who died of a disease of the brain impairing the sensibility, and who only breathed three or four times during that space.

The other changes observed in the vital system in sleep are evidently the consequence of the diminished frequency of respiration. This necessarily produces a proportional diminution in the frequency of the pulse; the properties of the blood being less frequently renovated in the lungs, it less readily excites the heart and vessels, and the diminished force of circulation is as necessarily attended with a diminished formation of the secreted fluids. This state of the vital organs, in its turn, influences the sensitive system, and thus the sleep is rendered more profound. While health continues, however, the vital powers are never sufficiently impaired to prevent the perfect restoration of those functions by which the animal is again fitted for intercourse with the external world.

The foregoing positions are well illustrated by the symptoms of apoplexy, in which a cause exists that prevents this restoration, and which consequently point out to us in a more striking manner the influence of the sensitive on the vital system. Here we find that in proportion as the sensibility fails, the respiration, and with it the pulse, continue to become slower; and when it has failed altogether, so that no cause of irritation can excite any sensation, the respiration ceases, and the loss of circulation soon follows. In this way the patient dies in sanguineous apoplexy, where the cause of derangement is a gradually increasing pressure on the brain, in consequence of which its sensibility is at length extinguished. Here there is no original disease of the vital organs. Could the sensibility be sufficiently maintained to preserve a due frequency of respiration, and nourishment from time to time be introduced into the stomach, life would go on as in sleep, till the increasing affection

* Such facts are adduced in the paper last referred to as I believe will be admitted to prove that respiration is at all times an act of volition, excited by the sensation caused by the want of fresh air in the lungs; and the more the sensibility is impaired, the want must be allowed to become the greater, in order to excite the effort which relieves it.

of the brain, extending from the sensitive to the vital parts of that organ, so deranged the assimilating processes as to destroy life in this way.

The accumulation of phlegm in the lungs in apoplexy arises from these processes being deranged by the failure of nervous influence. I have repeatedly, in apoplexy, removed this accumulation of phlegm, the breathing becoming as free as in health, by causing voltaic electricity to pass through the lungs in the direction of their nerves. This, it is evident, can have no direct tendency to remove the disease, although by its means life may often be prolonged, and thus more time afforded for the application of the means of cure, this accumulation of phlegm greatly impeding the due change of the blood in the lungs, and thus conspiring with the diminished frequency of respiration to deprive it of its vital properties*.

A short comparison of the symptoms of apoplexy from compression, with that which is with great propriety termed nervous, will throw additional light on this part of the subject.

It is shown by experiments detailed in papers which appeared in the *Philosophical Transactions* for 1815, that although the power of the heart and vessels is independent of the brain and spinal marrow, causes operating on these organs are capable of influencing them, and that even to the total destruction of their power. When, therefore, the cause of apoplexy, instead of being a gradually increasing pressure of the brain,—which I have found by experiment, however powerful it may be, has no direct influence on the action of the heart†,—is of such a nature as, while it impairs the sensibility, also directly impairs the power of the heart and blood-vessels, we have a disease of a very different nature from apoplexy from mere compression. In the latter, if we can remove the cause of pressure and prevent its recurrence, we invariably cure the disease. There is no other cause of derangement. The vital functions are only impeded by the want of the due change of the blood in the lungs, in consequence of failure in the functions of respiration and assimilation. Death here is necessarily slow, because it always requires some time for the gradually increasing pressure either to destroy the sensibility, and consequently wholly

* *Experimental Inquiry*, third edition, Part III. On the application of the experiments to explain the nature and improve the treatment of diseases, Chap. 1.

† *Ibid.* Part II.

stop respiration, or so derange the assimilating processes, as in this way to prove fatal, for from some peculiarity in the cause, the effect of which more readily than usual spreads to the vital parts of the brain, death, in apoplexy from compression, sometimes appears rather to arise from this derangement than the loss of sensibility, the phlegm gradually accumulating in the lungs till it wholly prevents the necessary change of the blood effected in them*.

But when the cause, which impairs the sensibility, also through the ganglionic system immediately enfeebles the heart and blood-vessels, the course of the disease is very different. We have here a cause at once impairing the powers of circulation; and when it is excessive, death is often instantaneous. Such is the cause of death from blows on the head, which, when not sufficient to produce instant death, produce what is called concussion of the brain, in which a state analogous to syncope is combined with impaired sensibility. The circulation is doubly assailed by the direct diminution of the power of its organs, and a failure in the stimulating power of the blood, in consequence of its less perfect decarbonization, and the former being the more powerful cause, obscures the effects on the vital organs of the latter. The pulse, instead of being slow but regular, and of unimpaired strength, is feeble, irregular, and fluttering, and a general paleness of the surface indicates a degree of failure of circulation, far beyond what is observed in cases of mere compression.

All sudden and excessive affections of the brain may produce the same effects as the blow on the head. Thus, people have instantly expired from rage or excessive joy, and thus in the mobs of Lord George Gordon, some from the sudden effect on the brain through the nerves of the stomach, expired on taking a draught of spirit of wine which they had mistaken for common gin.

But it is not necessary that the cause, as in these cases, should be either sudden or violent to produce this species of apoplexy. A long-continued recurrence of slighter causes weakening the powers of the brain, often, along with them, gradually impairs those of the heart and blood-vessels, in the same way that an infusion of tobacco, applied to the brain in the experiments above referred to, impaired their powers. These are the most common causes of

* This accumulation of phlegm in the lungs has been found experimentally to be the uniform consequence of lessening the supply of nervous influence in the lungs.—Philosophical Transactions for 1827 and 1828; and Experimental Inquiry, Part II.

nervous apoplexy; and in proportion as their operation has been slow, the course of the disease is less rapid.

Thus we see it supervene in those who have been long exposed to the irritations which attend the more serious and confirmed cases of indigestion or long-continued causes of anxiety, particularly in gouty habits, in which there is often a great tendency to debility in the vital organs; and we readily perceive from what has been said, why apoplexy from such causes is so generally fatal. The powers both of the nervous and circulating systems are undermined, and with them the secreting and other assimilating processes which depend on them. The powers which ought to respond to our remedies have failed. Our efforts therefore are for the most part equally unavailing in restoring either the sensibility or the powers of circulation, and both are necessary to recovery.

FROM a review of the whole of the facts which have been laid before the Society, it appears,—

That in the brain and spinal marrow alone reside the active parts of the nervous system.

That the law of excitement in the parts of these organs, which are associated with the nerves of sensation and voluntary motion, is uniform excitement followed by proportional exhaustion, which, when it takes place to such a degree as to suspend their usual functions, constitutes sleep; all degrees of exhaustion which do not extend beyond them and the parts associated with them, being consistent with health.

That the law of excitement in those parts of the brain and spinal marrow which are associated with the vital nerves is also uniform excitement, but which is only, when excessive, followed by any degree of exhaustion, no degree of which is consistent with health.

That the vital, in no degree partaking of the exhaustion of the sensitive system in sleep, only appears to do so in consequence of the influence of the latter on the function of respiration, the only vital function in which these systems cooperate.

That the law of excitement of the muscular fibre, with which both the vital and sensitive parts of the brain and spinal marrow are associated, is inter-

rupted excitement, which, like the excitement of the vital parts of these organs, is only, when excessive, followed by any degree of exhaustion. And

That the nature of the muscular fibre is everywhere the same, the apparent differences in the nature of the muscles of voluntary and involuntary motion depending on the differences of their functions, and of the circumstances in which they are placed.

I shall conclude this paper with a few observations on dreaming, immediately connected with the preceding parts of the subject.

Had we, independently of experience, been made acquainted with the nature of sleep, we might have foretold that dreaming,—pretty much as we find it,—would be its consequence.

We here find the sensitive parts of the brain, to which the powers of mind belong, and the parts associated with them, in a state of exhaustion, but not such exhaustion as prevents their being excited by slight causes, while other parts of the system are still in a state of activity. But it is only in the most perfect state of health, and such as we rarely enjoy, that the vital functions are performed without slight causes of irritation arising in some of their various and complicated processes, which tend to disturb the repose of the sensitive parts of the brain. Thus it is that indigestion and other internal causes of irritation produce dreaming. Such causes act partially, and therefore only partially excite those parts.

It seems greatly to influence the phenomena of dreaming, that in order to favour the occurrence of sleep, and thus as far as we can prevent unnecessary exhaustion, means are always employed at its accustomed times, to prevent, as much as possible, the excitement of the external organs of sense, and consequently those parts of the brain corresponding with them. This renders us the more sensible to causes of excitement existing within our own bodies, while, by the inactivity of those parts of the brain which correspond to the organs of sense, we are deprived of the usual control over such parts of the mental functions as are thus excited; the effect of which is greatly increased by the rapidity of the operations of the memory and imagination, when not restrained by some of the various means employed for that purpose in our

waking hours. These are often objects of the senses, as written language, diagrams, sounds, and sometimes even objects of touch; but the most common is the mere use of words, independently of any object presented to our senses.

Any one may easily perceive how difficult it is to pursue a train of reasoning without this means of detaining his ideas for the purpose of steadily considering them and comparing them together. Now, in sleep, in consequence of the excitement of the brain being so partial, we are deprived of all these means; and our ideas pass with such rapidity as precludes all consideration and comparison. Our conceptions therefore are uncorrected by experience, and we are not at all surprised at the greatest incongruities. Why should we be surprised at our moving through the air, when we are not aware that we have not always done so? The mind of the dreamer differs from that of the infant in having a fund of ideas laid up in it which may by various circumstances be partially recalled; but it resembles it in being in other respects void of the results of experience, and consequently, with the exception of this partial operation of experience, of the means of correcting the ideas excited in it. In general, there is neither time nor means for doubt or hesitation.

Such is the rapidity of our thoughts in dreaming, that it is not uncommon for a dream, excited by the noise that awakes us, and which therefore must take place in the act of awaking, to occupy, when put into words, more than fifty times the space in the relation. It is a good illustration of what is here said, that when we dream that we are conversing, and thus obliged to employ words, the usual incongruities of dreaming do not occur. The ideas are sufficiently detained to enable us to correct the suggestions of the imagination. No man ever dreamt that he was telling another that he had been flying through the air.

Thus the peculiarities of dreaming arise from the partial operation of the causes of disturbance, and some of the sensitive parts of the brain being capable of excitement without disturbing others; and thus it is that the more near we are to awaking, the more rational our dreams become, all parts of the brain beginning to partake of the excitement; which has given rise to the adage, that morning dreams are true.